

**WHAT IS CLAIMED IS:**

1. An isolated and purified DNA encoding a  
tocopherol associated protein p38 having the amino acid sequence  
5 of SEQ ID NO: 2.

2. The DNA of claim 1, wherein said DNA has the  
sequence shown in SEQ ID NO: 1.

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3. A vector comprising the DNA of claim 1 and  
regulatory elements necessary for expressing said DNA in a cell,  
wherein said DNA encodes a tocopherol associated protein p38  
15 having the amino acid sequence shown in SEQ ID NO: 2.

4. The vector of claim 3, wherein said vector is a  
plasmid.

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5. The vector of claim 4, wherein said plasmid is a tetracycline regulated plasmid.

5 6. The vector of claim 4, wherein said plasmid encodes a tocopherol associated protein p38 comprising a protein tag selected from the group consisting of a HA tag, a GST tag, a HIS tag and a green fluorescent protein tag.

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7. A host cell transfected with the vector of claim 3.

8. The host cell of claim 7, wherein said cell is  
15 selected from the group consisting of bacterial cells, mammalian cells, plant cells, yeast cells and insect cells.

9. An isolated and purified tocopherol associated  
20 protein p38 having the amino acid sequence shown in SEQ ID NO: 2.

10. An antibody directed against the tocopherol associated protein p38 of claim 9.

5            11. An isolated and purified DNA encoding a deletion mutant of tocopherol associated protein having an amino acid sequence selected from the group consisting of SEQ ID NOs: 15, 17 and 19.

10           12. The DNA of claim 11, wherein said DNA has a sequence selected from the group consisting of SEQ ID NOs: 14, 16 and 18.

15           13. A vector comprising the DNA of claim 11 and regulatory elements necessary for expressing said DNA in a cell, wherein said DNA encodes a deletion mutant of tocopherol associated protein having an amino acid sequence selected from the group consisting of SEQ ID NOs: 15, 17 and 19.

14. The vector of claim 13, wherein said vector is a plasmid.

5           15. The vector of claim 14, wherein said plasmid is a tetracycline regulated plasmid.

16. The vector of claim 14, wherein said plasmid  
10 encodes a deletion mutant of tocopherol associated protein comprising a protein tag selected from the group consisting of a HA tag, a GST tag, a HIS tag and a green fluorescent protein tag.

15           17. A host cell transfected with the vector of claim 13.

18. The host cell of claim 17, wherein said cell is selected from the group consisting of bacterial cells, mammalian  
20 cells, plant cells, yeast cells and insect cells.

19. An isolated and purified deletion mutant of tocopherol associated protein having an amino acid sequence selected from the group consisting of SEQ ID NOs: 15, 17 and 19.

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20. A mutated tocopherol associated protein p38, wherein said protein has a mutation that enhances biological function, said mutation selected from the group consisting of a  
10 mutation to the ligand binding domain, a mutation to the transactivation domain, a mutation to the nuclear localization domain, a mutation to the sequence specific DNA binding domain, a mutation to the non-sequence specific DNA binding domain, a mutation to the dimerization or tetramerization domain, and a  
15 mutation to a phosphorylation and dephosphorylation site.

21. A method for the treatment of cell proliferative diseases comprising the step of administering to an animal a  
20 pharmacologically effective dose of the vector of claim 3 or a vector

comprising a DNA that encodes a tocopherol associated protein p46 having the amino acid sequence shown in SEQ ID NO: 4.

5                   22. The method of claims 21, wherein said animal is a human or non-human.

                  23. The method of claims 21, wherein said cell  
10 proliferative disease is selected from the group consisting of neoplastic diseases and non-neoplastic disorders.

                  24. The method of claim 23, wherein said neoplastic  
15 disease is selected from the group consisting of ovarian cancer, cervical cancer, endometrial cancer, bladder cancer, lung cancer, breast cancer, testicular cancer, prostate cancer, gliomas, fibrosarcomas, retinoblastomas, melanomas, soft tissue sarcomas, osteosarcomas, leukemias, colon cancer, carcinoma of the kidney,  
20 pancreatic cancer, basal cell carcinoma and squamous cell carcinoma.

25. The method of claim 23, wherein said non-neoplastic disease is selected from the group consisting of psoriasis, benign proliferative skin diseases, ichthyosis, papilloma, restinosis, scleroderma, hemangioma, leukoplakia, viral diseases, autoimmune disorders and autoimmune diseases.

26. The method of claim 25, wherein said autoimmune diseases are selected from the group consisting of autoimmune thyroiditis, multiple sclerosis, myasthenia gravis, systemic lupus erythematosus, dermatitis herpetiformis, celiac disease, and rheumatoid arthritis.

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27. The method of claim 25, wherein said viral diseases is caused by human immunodeficiency virus.

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28. The method of claim 25, wherein said autoimmune disorders are selected from the group consisting of inflammatory

processes involved in cardiovascular plaque formation, ultraviolet radiation induced skin damage, and disorders involving an immune component.

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29. The method of claim 21, wherein said vector is administered in the form of an aerosolized liposome.

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30. The method of claim 29, wherein said liposome is dilauroylphosphatidylcholine.

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31. The method of claim 21, wherein said method inhibits tumor cell metastases.

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32. The method of claim 21, further comprising the step of administering an anti-cancer drug to said animal, wherein said anti-cancer drug is administered at a time selected from the group consisting of before the administration of said vector, after



the administration of said vector and concurrently with the administration of said vector.

5                    33. The method of claim 32, wherein said anti-cancer drug is selected from the group consisting of 9-nitrocamptothecin, paclitaxel, doxorubicin, 9-nitrocamptothecin, 5-fluorouracil, mitoxantrone, vincristine, cisplatin, epoposide, tocotecan, tamoxifen, and carboplatin.

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                  34. The method of claim 32, wherein said anti-cancer drug is administered in the form of an aerosolized liposome.

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                  35. An aerosolized liposome composition comprising a vector that encodes a tocopherol associated protein having an amino acid sequence selected from the group consisting of SEQ ID NOs: 2, 4, 15, 17 and 19.

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36. The liposome composition of claim 35, wherein said liposome is dilauroylphosphatidylcholine.

5            37. The liposome composition of claim 35, wherein said composition comprises about 5% to 7.5% carbon dioxide.

            38. The liposome composition of claim 35, wherein  
10    said composition comprises polyethylenimine nitrogen and DNA phosphate at a ratio (nitrogen:phosphate) from about 5:1 to about 20:1.